National Defense Center for Energy and Environment

Implementing Distributed Wind Power at Military Installations: Site Assessment, Approval and System Design

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Technology Transition – Supporting DoD Readiness, Sustainability, and the Warfighter

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Presentation Highlights

- Task Overview
- Site Assessment
- Site Approval
- Initial System Design/Procurement
  - SOW
  - RFP
  - Equipment Evaluation
  - Procurement
- Final System Design
- Next Steps

FY07 Regional Sustainability Solutions Technology Development, Demonstration, and Validation – Pacific Rim Region

Identify and conduct a technology demonstration/ validation project in the Hawaiian Island region to support the Service's sustainability goals and objectives

Team Members

- Naval Facilities Engineering Command, Hawaii (NAVFAC Hawaii)
- Pearl Harbor Naval Complex (Pearl City Peninsula Family Housing)
- Ohana Military Communities/Forest City Military Communities (FCMC) Hawaii
- National Renewable Energy Laboratory (NREL)
- National Defense Center for Energy and Environment (NDCEE)

Project Approach

- Identify key sustainability issues for Hawaii
- Identify/evaluate technology opportunities that will address the issues
- Demonstrate a technology opportunity that has transition potential
  - Site Assessment/Approval
  - Equipment Specifications/Evaluation
  - Procurement and Installation
  - Demonstration and Final Report
- Technology transition with focus on Pacific Rim Region

Initial Work

- Identification of key regional issues resulted in a decision to demonstrate a renewable energy system
  - Helps meet numerous local and military initiatives
  - Reduces the military's utility costs
  - Eases energy security concerns
  - Helps protect Hawaii's unique cultural and natural resources by reducing fossil-fuel generated pollution
- Technical assessment of six technologies indicated that solar and wind were the best choices
- Initial economic evaluation of wind/solar indicated that wind had fastest investment recovery/lowest financial risk

Pre-Procurement Activities

1. Preliminary Site Assessment
2. Site Approval
3. Site Assessment
4. Equipment Specifications
5. Request for Proposal
6. Equipment Evaluation

Site Assessment

Preliminary Site Assessment

- Conducted by NREL
- Wind maps
- Site visit
- Decision to proceed

Site Assessment

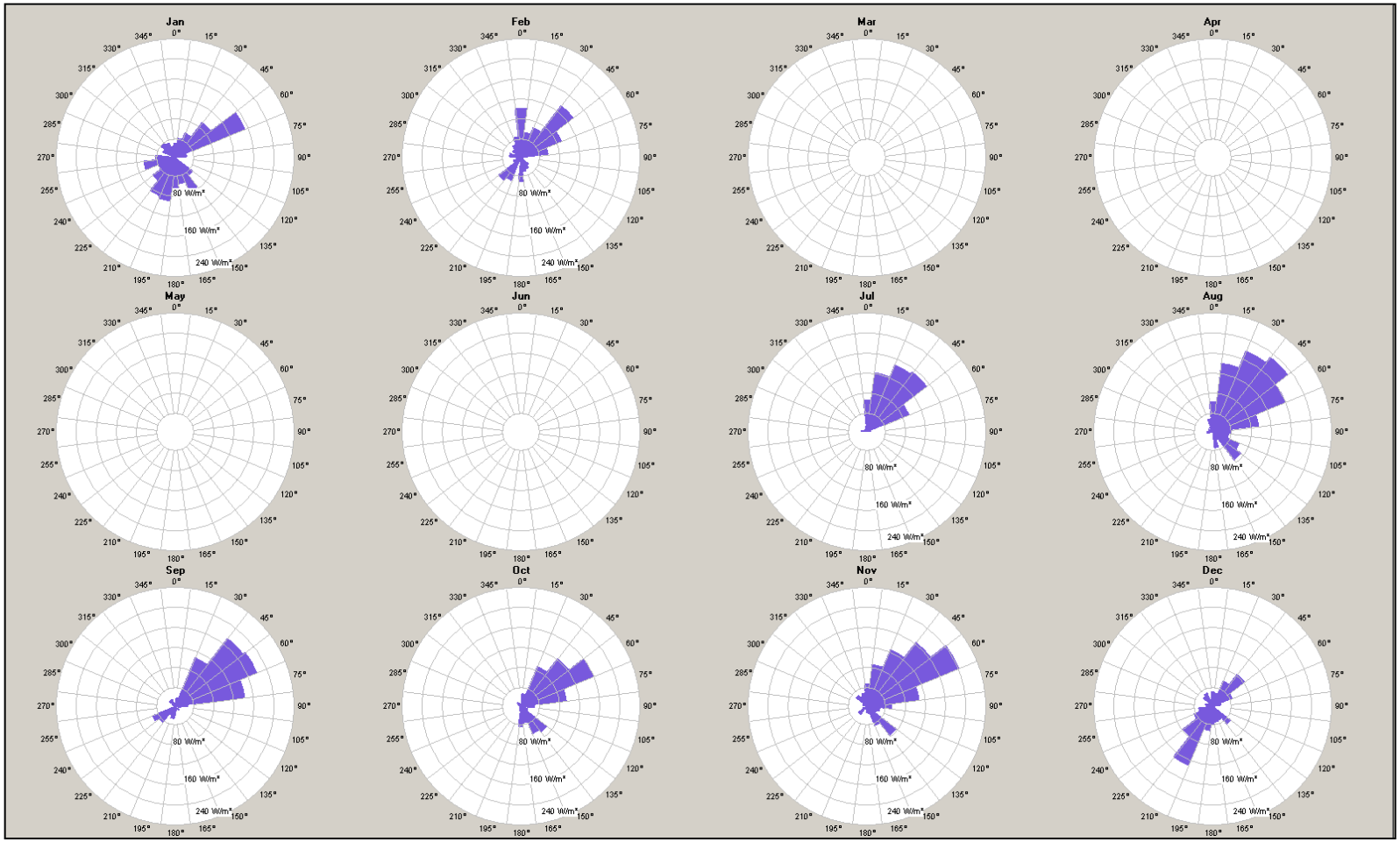
- Anemometer tower at site
- 6 months of wind data

Wind Resource

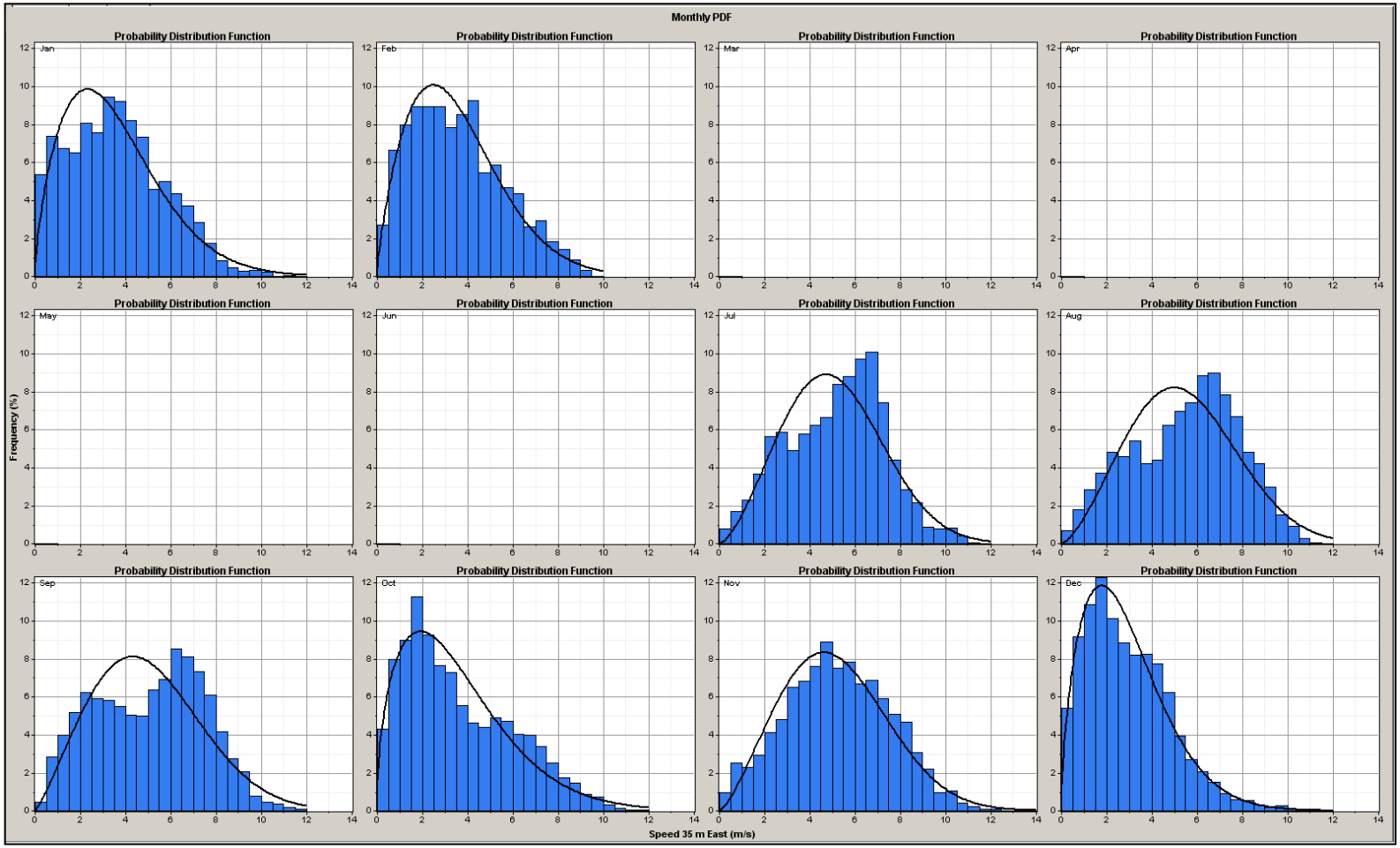
Site Assessment

- Anemometer data
  - Data collection period: July 17, 2009 – February 8, 2010
  - Data collection: 10-minute intervals at various heights
    - 50 meters West
    - 50 m East
    - 35 m West
    - 35 m East
    - 20 m West
    - 20 m East
  - Data summary report provided by NREL

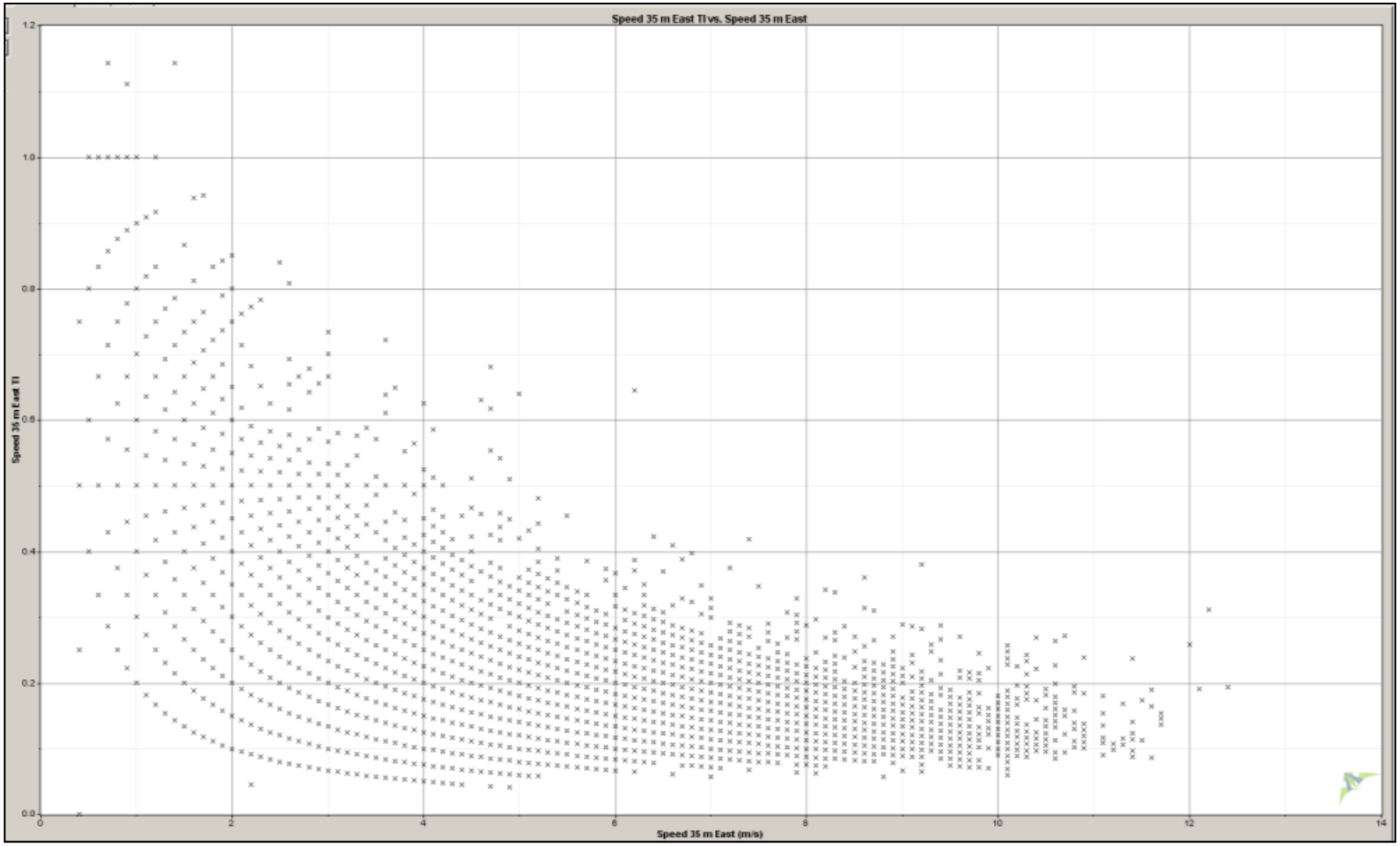
Pearl City Wind Rose at 35m East (W/m²) Data Collected July-Feb



Pearl City Wind Speed Distribution by month at 35m East



Pearl City Turbulence Intensity at 35m East



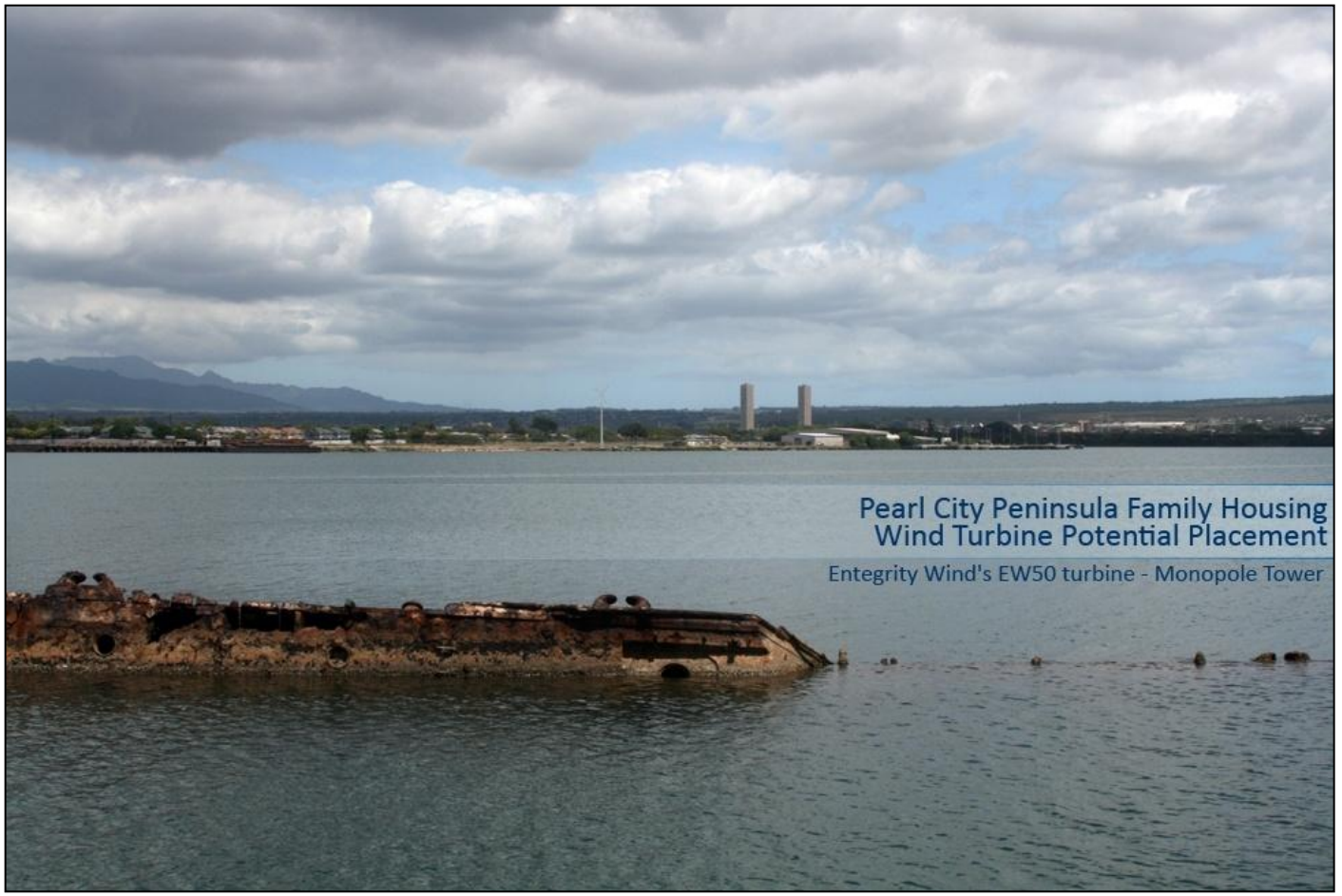
Site Approval Process

- Requirements
  - NEPA CATEX
  - State Historic Preservation Officer (SHPO) approval needed as it is an historic site
  - Navy approval
- Responsibility
  - Bulk of work conducted by Ohana
  - NDCEE provided technical input to process

CATEX

- Effect on public health and safety
- Effect on wetlands, threatened or endangered species, historic or archeological resources, or hazardous waste sites
  - Sampling and disposal plan due to PCBs

SHPO Requirement – View from Historic Site



Navy Approval – Requested Info

- Pole type of wind turbine (tube or lattice)
- Foundation type/dimensions
- Overall height
- Rotor diameter
- Projections
- Electric connections
- Ownership
- Site description
- Decibel level
- Previous restoration information

Development of Equipment Specifications

- Met with Navy to discuss interconnectivity issues and data monitoring communication requirements
- Navy provided additional requirements and design guide
- 40 kW – 100 kW turbine
- Turnkey activities
- Client capabilities
- Budget/schedule/site constraints

Vendor SOW Requirements

- Task 1: Investigation
- Task 2: Construction Design
- Task 3: Implementation
- Task 4: Equipment Commissioning and Testing
- Task 5: Distribution of Technical Manuals & Publications
- Task 6: Demonstration
- Task 7: Sustainment
- Task 8: Documentation

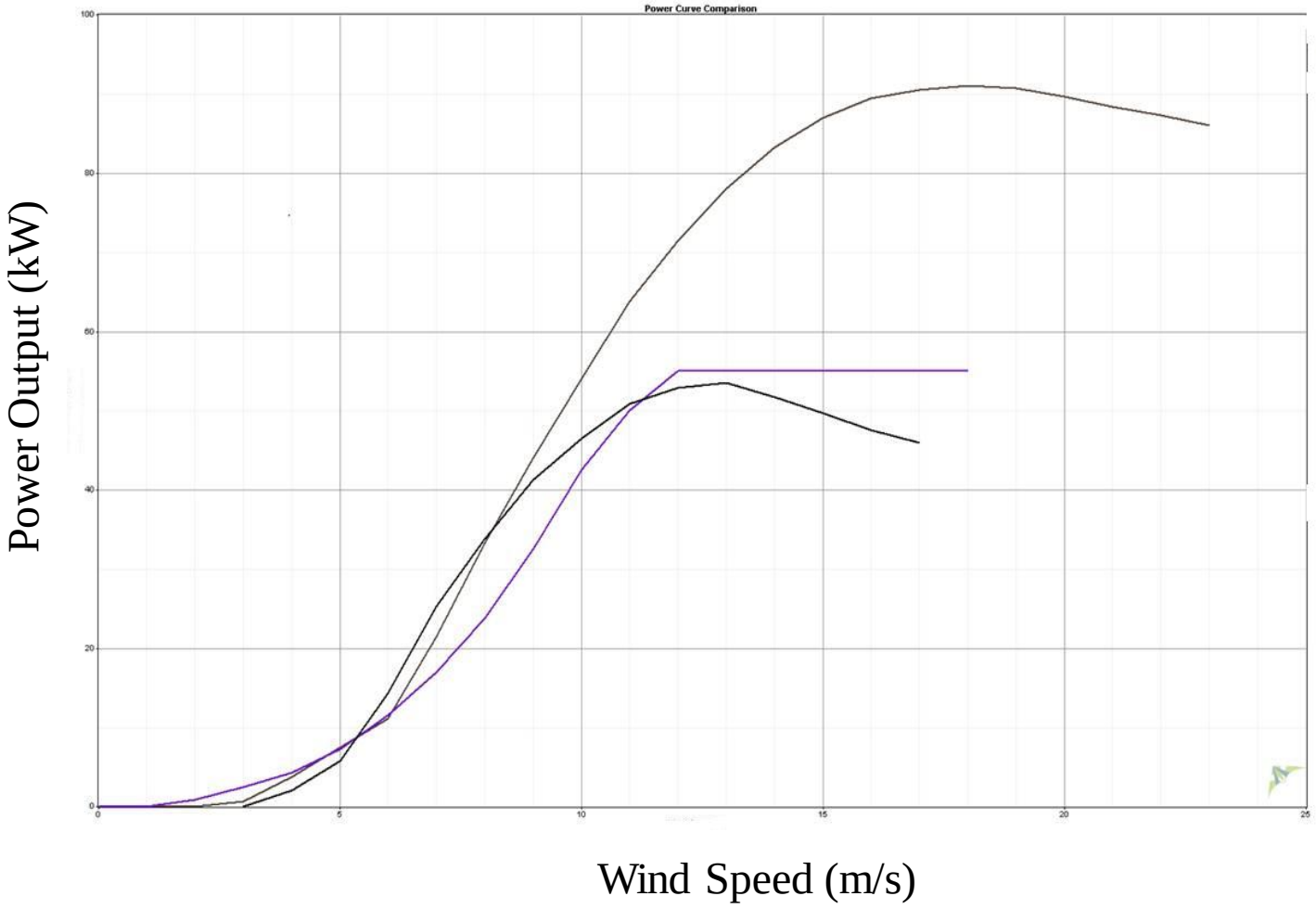
RFP

- Issued November 2009
- Requested a turnkey system
- Provided:
  - Wind resource data summary
  - Aerial photo of proposed turbine location
  - Utility lines in immediate area
  - NAVFAC utility requirements
  - HECO Utility Interconnection Agreement
  - Initial geotech results
- Identified 6 vendors
- Held a vendor teleconference
- Addressed email questions
- Received 3 proposals
- Conducted technical and economic evaluation

Equipment/Proposal Evaluation

- Technical Evaluative Criteria
  - #1: *Meets all Statement of Work Requirements*
  - #2: *Experience and History*
  - #3: *Equipment*
  - #4: *Schedule*
- Economic Evaluative Criteria
  - #1: *Total Costs*
  - #2: *Capital Investment Financial Indicators*
  - #3: *Confidence in Proposal Price*

Power Curve Comparison



Economic Evaluation

- Small Wind Energy Economic Tool (version 2.0) developed by NREL
- Uses average wind speed and distribution taken from measured data
- Results are not precise but rather provide a rough estimate result.
- Sufficient to conduct a comparison between the different turbines
- Result highly dependent on accuracy of power curve
  - Third-party validated
  - Estimated wind curve

Turbine Site

Summary/Lessons Learned

- Conducted thorough site assessment with assistance from NREL and Ohana
- Military site approval process is quite lengthy
- Owner/Utility requirements must be identified
- Limited turnkey vendor options
- Turbine availability is an issue
- Accuracy of power curve is critical
- A multi-organizational team is beneficial to completing project

Next Steps

- Work with Ohana and vendor on system design
- Install wind turbine system and auxiliary equipment
- Execute start-up and commissioning activities
- Demonstrate/validate technology
- Transition Technology

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